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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/807,985 | 03/24/2004 | Nobukazu Ikoma | 789_128 | 8509 |

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| EXAMINER | |
|---|---|
| MERKLING, MATTHEW J | |
| ART UNIT | PAPER NUMBER |
| 1709 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 02/13/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/807,985 | IKOMA ET AL. | |
| | Examiner | Art Unit | |
| | Matthew J. Merkling | 1709 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 March 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/24/04 and 8/16/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to because Fig. 2 labels the automobile and the exhaust tube as '54'. According to the disclosure, the automobile should be label as '52'. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato (US 6,348,141) in view of Atsumi (US 2003/0121782).

Regarding claim 1, Kato discloses a gas sensor comprising a sensor element for measuring a predetermined gas component contained in an introduced measurement gas, and a protective cover (fig. 1) arranged to surround the sensor element; wherein the protective cover includes an inner protective cover (100) for covering at least a forward end portion of the sensor element; an outer protective cover (102) for covering the inner protective cover; and an intermediate protective cover (104) installed between the inner protective cover and the outer protective cover (col. 2 lines 21-30). Kato also discloses the inner protective cover is formed to have a bottom-equipped cylindrical configuration with an inner gas-introducing hole (106) which is formed at a position opposed to the sensor element and with an inner gas discharge hole (108) which is formed at a bottom portion; the outer protective cover is formed to have a bottom-equipped cylindrical configuration with an outer gas-introducing hole (110) which is disposed at a position not opposed to the inner gas-introducing hole of the inner protective cover; and the intermediate protective cover has an intermediate gas-introducing hole (118) which is disposed at a position not opposed to the inner gas-

introducing hole of the inner protective cover and the outer gas-introducing hole of the outer protective cover (col. 2. lines 52-65). Kato also discloses that said inner protective layer includes a plurality of inner gas inlet holes (col. 12 lines 23-26, fig. 1 (106)). Kato also illustrates that the outer protective layer contains a plurality of outer gas inlet holes (col. 12 lines 30-31. fig. 1 (110)). Kato discloses all the limitations of claim 1 except the claimed ratio $A1/A2 \geq 1$, where A1 represents a total opening area of said inner gas inlet holes and A2 represents a total opening area of said outer gas inlet holes.

Atsumi teaches a gas sensor with a protective cover on the end of said gas sensor comprising an inner protective cover (cup, fig. 1 (102)) with gas inlet holes (second gas hole, fig. 1 (104)) and an outer protective cover (cup, fig. 1 (101)) with gas inlet holes (first gas hole, fig. 1 103)) (paragraph 0009). This gas sensor with protective cover is illustrated in fig. 1.. Atsumi also discloses that an area (fig. 5, D1) of the inner gas inlet holes (fig.3, 104) and an area (fig. 5, D2) of the outer gas inlet holes (fig. 3, 103) as both having a range of 1-10 $mm^2$ with a specific example of these areas as both being 4.9$mm^2$ (paragraph 41 and 43). Atsumi discloses that there are an equal number, 8, of outer gas inlet holes (first circular gas holes, 103) and inner gas inlet holes (second circular gas holes, 104) (paragraph 0030). This specific example gives an area, D1 (outer gas inlet hole), of 4.9$mm^2$, which gives a total area (A2, as claimed) of 39.2$mm^2$, and an area, D2 (inner gas inlet holes), of 4.9$mm^2$, which gives a total area (A1, as claimed) of 39.2$mm^2$. This corresponds to a ratio A1/A2 (as claimed) of 1, which reads on the range of claim 1. Atsumi discloses that if D1 is too small the resistance to flow of the gas to be measured into the outer protective cover becomes too large, thus causing

a bad influence on the accuracy in detection by the sensor (paragraph 42) and that if D1 is too large, it becomes difficult to cause a delay in the inflow of gas to be measured. Thus, before a fall in an output of the sensor is completed, a rise of the output starts, thus causing a possibility of deteriorating the accuracy in detection (paragraph 42). Atsumi discloses that if D2 is too small the resistance to flow of the gas to be measured into the outer protective cover becomes too large, thus causing a bad influence on the accuracy in detection by the sensor (paragraph 42) and that if D2 is too large, it becomes difficult to cause a delay in the inflow of gas to be measured. Thus, before a fall in an output of the sensor is completed, a rise of the output starts, thus causing a possibility of deteriorating the accuracy in detection (paragraph 44). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Atsumi's sized inner and outer gas inlet holes with the water scattering protective cover of Kato in order to improve the accuracy and water droplet protection of said gas sensor.

Regarding claim 4, Kato further discloses the inner gas inlet holes are formed at approximately equal distances circumferentially around the inner protective cover (col. 13 lines 37-42). The inner gas inlet holes are also illustrated in fig. 9 (106).

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kato and Atsumi as applied to claim 1 above, and further in view of Yamada et al. (US 6,279,376).

The modified Kato discloses all of the claim's limitations of the gas sensor, but does not explicitly disclose the number of inner gas inlet holes as greater than the

number of outer gas inlet holes. Yamada et al. teaches a gas sensor with an inner protective cover and outer protective cover each with gas inlet holes to allow communication between the sensor element (contained within the inner protective layer) and the measurement gas outside of the outer protective layer. Yamada et al. also teaches that the number of gas inlet holes on the inner protective cover and outer protective cover is a variable that is known to have an effect on the response time of the gas sensor at the time of the invention as is shown by Yamada et al (col. 6 lines 59-62). The number of inner gas inlet holes with respect to the number of outer gas inlet holes is not considered to confer patentability to the claim. As the number of the inner gas and outer gas inlet holes is a variable that can be modified, as is taught by Yamada et al. to alter the response time of the gas sensor, the number of gas inlet holes would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed number of inner gas inlet holes relative to the number of outer gas inlet holes cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the number of inner gas inlet holes and outer gas inlet holes in the modified Kato to obtain the desired response time (In re Boesch, 617 F. 2d. 272, 205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kato and Atsumi as applied to claim 1 above, and further in view of Toguchi et al. (US 6,948,353).

The modified Kato teaches all of the claims limitations but does not teach plate sections extending over each of the inner gas inlet holes. Toguchi et al. teaches a gas sensor (fig. 7 (1)) employed in a burning control system for automotive engines to measure the concentration of a gas component, with an inner protective cover (inner cover (2)) and an outer protective cover (outer cover (3)) each with a plurality of inner gas inlet holes and outer gas inlet holes (fig. 12a, (245 and 345, respectively) (col. 1 lines 64-67, col. 2 lines 1-12). Toguchi illustrates said inner cover (fig. 12(b), 247) gas inlet holes (245) as having a portion of a side wall cut and bent inward, preferably in the same orientation, covering said gas inlet hole in order to facilitate the ease of entrance of a measurement gas into a gas chamber (fig. 7 (112)) (col. 13 lines 11-23). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the plate sections over the inner gas inlet holes of Toguchi to the device of the modified Kato in order to ease the entrance of a measurement gas into the gas chamber.

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kato and Atsumi as applied to claim 1 above, and further in view of Watanabe et al. (US 6,214,186).

The modified Kato teaches all of the claim's limitations but does not disclose that the inner gas inlet holes are arranged in first, second and nth groups, each on a different circumference of the inner protective cover. Watanabe et al. teaches a gas

sensor (fig. 1 (1)) having an outer (fig. 6(a), (21)) and inner (22) protective cover, each with gas inlet holes (211 and 221, respectively) to communicate with a sensor element (fig. 1 (10)) contained inside the inner protective cover (col. 7 lines 13-25). Watanabe also illustrates an inner protective cover (fig. 11 (22)) with a first, second, and nth group of gas inlet holes each located on a different circumference of said inner protective cover and each at regular intervals around each circumference (col. 8 lines 12-15). The arrangement and number of gas inlet holes on the inner protective cover was a variable that was known to have an effect on the response time of the gas sensor at the time of the invention as is shown by Yamada et al. (US 6,279,376) (col. 6 lines 59-62, col. 7 lines 1-3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to increase the number and arrangement of holes of the modified Kato as shown by Watanabe et al. in order to allow for a faster and improved response to changes in a measurement gas.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kato and Atsumi as applied to claim 1 above, and further in view of Young et al. (US 6,071,476).

The modified Kato teaches all of the claim's limitations but does not disclose a perpendicular orientation of the protective cover in relation to the gas tube to which it is installed. Young et al. teaches a gas sensor that can be used in an internal combustion engine exhaust stream (col. 1 lines 36-42). Young et al. also teaches that the installation of said gas sensor in an orientation substantially perpendicular to the exhaust gas flow results in more reproducible results and minimizes application-to-application variations in sampling and sensor response times, thereby providing

accurate evaluation of the catalytic converter (col. 17 lines 6-11). It would have been obvious to one of ordinary skill in the art at the time the invention was made:

a. To install the protective cover of said gas sensor in a substantially identical orientation to the gas tube as the gas sensor itself, and,

b. To combine the perpendicular orientation of the gas sensor of Young et al. and the gas sensor of the modified Kato to improve the reproducibility and minimize the sampling variations in said gas sensor.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kato and Atsumi as applied to claim 1 above, and further in view of Nakamura et al. (US 6,780,298).

The modified Kato teaches all of the claims limitations but does not disclose the inclined orientation of the protective cover. Nakamura et al. teaches a gas sensor that can be used in an internal combustion engine exhaust stream (col. 1 lines 7-9). Nakamura et al. discloses that the inclination of the gas sensor (as well as the protective cover) is a variable that can control the response time and the water splash resistance of said gas sensor. Nakamura teaches that inclining a gas sensor tip end in a downstream direction of a gas flow will slow down the response time of said gas sensor (col. 2 lines 25-27). Nakamura also teaches that inclining the gas sensor tip end in an upstream direction of said gas flow will deteriorate a water splash resistance of said gas sensor (col. 2 lines 27-29). It would have been obvious to one of ordinary skill in the art at the time the invention was made to install the gas sensor and protective cover of Kato, at an inclination as taught by Nakamura in order to decrease the

response time of said gas sensor or to increase the water splash resistance of said gas sensor.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Merkling whose telephone number is 571-272-9813. The examiner can normally be reached on Monday - Friday 8:30-4:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa D. Neckel can be reached on 571-272-9827. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MJM

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